

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Previously Amended) An apparatus to make a certain volume of liquid available for atomization, the apparatus comprising:
 - a container adapted to hold a liquid;
 - a piston pump comprising a piston member and a valve body, wherein the piston member is slidable within the valve body, and wherein the valve body functions with the piston member to define a metering chamber, wherein the metering chamber is adapted to be filled with liquid from the container when the piston member is moved to a filling position, and wherein the piston pump is adapted to dispense a known volume of the liquid from the metering chamber when the piston member is moved to a dispensing position; and
 - a biasing member disposed between the container and the piston member to bias the piston member in the direction of the dispensing position and to require a force to be placed on the piston member to move the piston member to the filling position.
2. (Cancelled)
3. (Previously Amended) An apparatus as in claim 1, wherein the piston member has a proximal end and a distal end, wherein the piston pump further comprises a tubular valve seat slidably disposed about the distal end of the piston member such that the liquid within the metering chamber moves the tubular valve seat distally over the piston member to allow the liquid in the metering chamber to be dispensed by flowing between the piston member and the tubular valve seat when the piston member is moved toward the dispensing position.
4. (Original) An apparatus as in claim 3, wherein the tubular valve seat is slidable within the valve body, wherein the valve body defines a stop to stop distal movement of the tubular valve seat relative to the piston member, and wherein the biasing member forces the

distal end of the piston member into a distal end of the tubular valve seat to provide a seal between the piston member and the tubular valve seat.

5. (Original) An apparatus as in claim 4, wherein the proximal end of the piston member includes a resilient frontal end that contacts the valve body.

6. (Original) An apparatus as in claim 5, wherein a proximal portion of the valve body includes a set of crenellations that provide fluid passageways to the liquid in the container, and wherein the resilient frontal end is moved over the crenellations when in the filling position, and wherein a vacuum is created within the metering chamber while the piston member is being moved to the filling position such that liquid within the container is drawn into the metering chamber when the piston member is at the filling position.

7. (Original) An apparatus as in claim 6, wherein the valve body includes an expansion region distal to the crenellations, wherein the distance between the expansion region and the crenellations defines a valve stroke where the vacuum is created in the metering chamber during movement to the filling position, and wherein the volume of the liquid dispensed is determined based on the stroke.

8. (Previously Amended). An apparatus as in claim 4, wherein the distal end of the piston member has a rounded surface, and wherein the distal end of the tubular valve seat includes a rounded portion to mate with the distal end of the piston member and to provide a line seal when received into the rounded portion.

9. (Original) An apparatus as in claim 8, wherein the tubular valve seat further includes a buffer channel that extends distally from the rounded portion to prevent contaminated liquid from passing back up into the container.

10. (Original) An apparatus as in claim 1, further comprising a tube piston slidably disposed within the container, wherein the tube piston slides toward the piston pump as liquid is drawn out of the container and into the metering chamber.

11. (Original) An apparatus as in claim 1, wherein the metering chamber defines a volume in the range from about 10 microliters to about 150 microliters.

12. (Previously Amended) An apparatus for nebulizing a liquid, the apparatus comprising:

a housing;

a vibratable member disposed within the housing, the vibratable member comprising a front surface, a rear surface, and a plurality of apertures extending therebetween;

a liquid supplier disposed within the housing which is adapted to deliver a certain volume of liquid to the rear surface; and

a vibrator which vibrates the vibratable member to eject liquid droplets from the front surface of the vibratable member;

wherein the liquid supplier comprises a container adapted to hold a liquid, and a piston pump comprising a piston member and a valve body which function together to define a metering chamber, wherein the metering chamber is adapted to be filled with liquid from the container when the piston member is moved within the valve body to a filling position, and wherein the piston pump is adapted to dispense a known volume of the liquid from the metering chamber when the piston member is moved to a dispensing position; and

wherein the apertures are tapered to narrow from the rear surface to the front surface.

13. (Original) An apparatus as in claim 12, wherein the piston member has a distal end which is disposed in the vicinity of the rear surface of the vibratable member.

14. (Cancelled).

15. (Original) An apparatus as in claim 12, further comprising a tube piston slidably disposed within the container, wherein the tube piston slides toward the piston pump as liquid is drawn out of the container and into the metering chamber.

16. (Previously Amended) An apparatus as in claim 12, wherein the piston member has a proximal end and a distal end, wherein the piston pump further comprises a tubular valve seat slidably disposed about the distal end of the piston member such that the liquid within the metering chamber moves the tubular valve seat distally over the piston member to allow the liquid in the metering chamber to be dispensed by flowing between the piston member and the tubular valve seat when the piston member is moved toward the dispensing position, wherein the distal end of the piston member has a rounded surface, and wherein the distal end of the tubular valve seat includes a rounded portion to contact the distal end of the piston member and to provide a line seal when received into the rounded portion.

17. (Currently Amended) A method to make a certain volume of liquid available for atomization, the method comprising:

drawing liquid from a container into a metering chamber with a vacuum to fill the metering chamber with liquid;

dispensing a known volume of the liquid from the metering chamber such that a known volume of the liquid is available for atomization;

providing a piston pump to draw the liquid from the container, wherein the piston pump includes a piston member that is slidable within a valve body, and wherein the piston member and the valve body function to define the metering chamber;

moving the piston member to a filling position to fill the metering chamber with liquid, and moving the piston member to a dispensing position to dispense the liquid from the metering chamber; and

biasing the piston member in the direction of the dispensing position to require a force to be placed on the piston member to move the piston member to the filling position; and

wherein the valve body operably connected to the container and includes crenellations that provide fluid passageways to the container, wherein the piston member is slidable within the valve body, and further comprising sliding the piston member to the filling position where liquid flows through the crenellations to fill the metering chamber.

18-20. (Cancelled)

21. (Cancelled)

22. (Currently amended) A method as in claim ~~21~~ 17, wherein the piston member has a proximal end and a distal end, wherein the piston pump further comprises a tubular valve seat slidably disposed about the distal end of the piston member such that when the piston member is biased in the direction of the dispensing position, the liquid within the metering chamber moves the tubular valve seat distally over the piston member to allow the liquid in the metering chamber to be dispensed by flowing between the piston member and the tubular valve seat.

23. (Original) A method in claim 22, wherein the tubular valve seat is slidable within the valve body, and further comprising stopping distal movement of the tubular valve seat relative to the piston member with a stop on the valve body after the known volume of the liquid has been dispensed from the metering chamber.

24. (Previously Amended) A method as in claim 22, wherein the distal end of the piston member has a rounded surface, and wherein biasing of the piston member forces the distal end of the piston member into a rounded portion within the tubular valve seat to provide a line seal between the piston member and the tubular valve seat.

25. (Original) A method as in claim 24, wherein the valve seat includes a buffer channel distal to the conical portion, and further comprising permitting undispensed liquid to collect in the buffer channel.

26. (Currently amended) A method as in claim ~~21~~ 17, wherein the proximal end of the piston member includes a resilient frontal end to contact the proximal end of the piston member against the valve body, and further comprising proximally moving the resilient front end to create the vacuum within the metering chamber so that when the piston member reaches the filling position, liquid within the container is drawn into the metering chamber.

27. (Original) A method as in claim 26, wherein the valve body further includes an expansion region distal to the crenellations, and further comprising moving the resilient frontal end a full stroke from the crenellations to the expansion region to dispense the known volume.

28. (Original) A method as in claim 27, further comprising varying the distance between the expansion region and the crenellations to change the volume dispensed.

29. (Original) A method as in claim 17, wherein the container includes a tube piston that is slidably disposed within the container, and further comprising permitting the tube piston to slide toward the tubular valve seat as liquid is drawn out of the container and into the metering chamber.

30. (Original) A method as in claim 17, wherein the known volume of dispensed liquid is in the range from about 10 microliters to about 150 microliters.

31. (Previously presented) An apparatus to make a certain volume of liquid available for atomization, the apparatus comprising:

a container adapted to hold a liquid;

a piston pump comprising a piston member and a valve body, wherein the piston member is slidable within the valve body, and wherein the valve body functions with the piston member to define a metering chamber, wherein the metering chamber is adapted to be filled with liquid from the container when the piston member is moved to a filling position, and wherein the piston pump is adapted to dispense a known volume of the liquid from the metering chamber when the piston member is moved to a dispensing position; and

a tube piston slidably disposed within the container, wherein the tube piston slides toward the piston pump as liquid is drawn out of the container and into the metering chamber.

32. (Previously presented) An apparatus for nebulizing a liquid, the apparatus comprising:

a housing;

a vibratable member disposed within the housing, the vibratable member comprising a front surface, a rear surface, and a plurality of apertures extending therebetween;

a liquid supplier disposed within the housing which is adapted to deliver a certain volume of liquid to the rear surface; and

a vibrator which vibrates the vibratable member to eject liquid droplets from the front surface of the vibratable member;

wherein the liquid supplier comprises a container adapted to hold a liquid, and a piston pump comprising a piston member and a valve body which function together to define a metering chamber, wherein the metering chamber is adapted to be filled with liquid from the container when the piston member is moved within the valve body to a filling position, and wherein the piston pump is adapted to dispense a known volume of the liquid from the metering chamber when the piston member is moved to a dispensing position; and

wherein the piston member has a proximal end and a distal end, wherein the piston pump further comprises a tubular valve seat slidably disposed about the distal end of the piston member such that the liquid within the metering chamber moves the tubular valve seat distally over the piston member to allow the liquid in the metering chamber to be dispensed by flowing between the piston member and the tubular valve seat when the piston member is moved toward the dispensing position, wherein the distal end of the piston member has a rounded surface, and wherein the distal end of the tubular valve seat includes a rounded portion to contact the distal end of the piston member and to provide a line seal when received into the rounded portion.

33. (Previously presented) A method to make a certain volume of liquid available for atomization, the method comprising:

drawing liquid from a container into a metering chamber with a vacuum to fill the metering chamber with liquid;

dispensing a known volume of the liquid from the metering chamber such that a known volume of the liquid is available for atomization; and

wherein the container includes a tube piston that is slidably disposed within the container, and further comprising permitting the tube piston to slide toward the tubular valve seat as liquid is drawn out of the container and into the metering chamber.

34. (New) A method to make a certain volume of liquid available for atomization, the method comprising:

drawing liquid from a container into a metering chamber with a vacuum to fill the metering chamber with liquid;

dispensing a known volume of the liquid from the metering chamber such that a known volume of the liquid is available for atomization;

providing a piston pump to draw the liquid from the container, wherein the piston pump includes a piston member that is slidable within a valve body, and wherein the piston member and the valve body function to define the metering chamber;

moving the piston member to a filling position to fill the metering chamber with liquid, and moving the piston member to a dispensing position to dispense the liquid from the metering chamber;

biasing the piston member in the direction of the dispensing position to require a force to be placed on the piston member to move the piston member to the filling position; and

wherein the container includes a tube piston that is slidably disposed within the container, and further comprising permitting the tube piston to slide toward the tubular valve seat as liquid is drawn out of the container and into the metering chamber.